Operating Manual

AD11-1P45-x / AD11-1PCT-x / AD11-1PRJ-x

DIN rail mount Single Phase AC Energy Meter



DMAN-00IM-1743 Rev. L - 12/25

Manual Subject to Change Without Notice

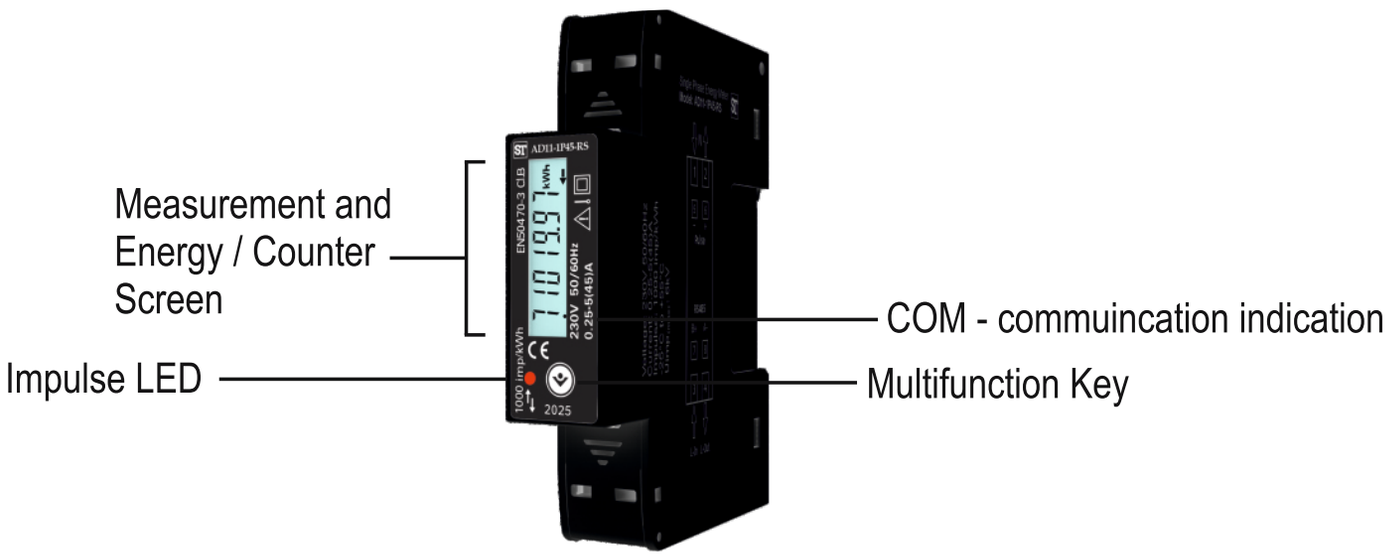
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1. INTRODUCTION

The Energy Meter is a DIN Rail mounted Digital Meter, primarily for bidirectional Active, Reactive and Apparent Energy measurement intended for use in industrial, commercial and residential electrical energy metering. It also accurately measures important electrical parameters like TRMS Voltage, TRMS Current, Frequency, Active / Reactive and Apparent Power, and Power Factor in Single Phase Networks. The meter is engineered using advanced microcontroller technology and is suitable for electrical parameter measurement and monitoring in 1 Phase 2 Wire Networks. It supports maximum 45 A current measurement on direct connected meters and 1A / 5A and 100mA current measurement on external CT connected meters. It displays parameters on bright intuitive LCD and also has Pulse Outputs and Impulse LED for energy monitoring. It supports Tariff Counters selectable via Tariff Input or MODBUS / MBUS Communication as per model. It has inbuilt industry standard MODBUS RTU and MBUS for remote monitoring.



2. LCD Display

2.1. Introduction

The meter displays more than 40 measurement parameters including Total Energies, Tariff, Partial and also other important electrical parameters like Max Demand, Voltage, Current, Frequency, Active Power, Reactive Power, Apparent Power and Power Factor on individual screens. The user can easily scroll the Parameter By Pressing key and By Pressing and Holding key for 5 Seconds on screen 2 option the user can see Tarrif & Demand Parameters. again Pressing and Holding key for 5 Seconds on screen 1 option it back to the Main Parameter . For Setup menu the user need to Press & Hold the Key on measurement parameters screen. Refer Table 1 & Table 2 for list all the Measurement Parameters available on Display and MODBUS and MBUS.

2.2. LCD Display Symbols and Indications

The LCD has bold seven segment digits with bright white backlit for display of measurement parameters. Special symbols and units are provided for effective display and easy onsite configuration. Indications for current reversal, communication status, active tariff available on screen. Measurement screen can be set as automatic scrolling or manual scrolling.

2.2.1 Communication Indication

The meter provides communication based on MODBUS and MBUS protocol for remote data acquisition of measurement data and configuration. If meter is properly communicating with host than it is indicated by symbol as shown:



The dot symbol on LCD indicates that the meter is communicating.

2.2.2 Tariff Energies Indication



This Instrument comes with 2 tariff based on Tariff Inputs or Modbus or MBUS. In the image given here, it indicates that the instrument is currently displaying the selected energy parameter (Import Active Energy) of Tariff 1.

These Tariff energies and Demand parameters are available on display screen 2, For opening the Screen 2 Press and hold the Key for 5 Seconds on Display 2 Option

Tariff Indication : Meter has tariff function and indicated by symbol **T**, The digit after this symbol indicates tariff number either 1 or 2.

Other Labels: Σ - Indicates Total parameter , ← - indicates Import parameter , → - indicates export parameter.

2.2.3 Start-up Screens



Display check screen



CRC Lower Byte screen



CRC Higher Byte screen



Software version screen

NOTE : CRC will be calculated after 3 minutes of power ON the meter.

TABLE 1 : Measurement Parameters:

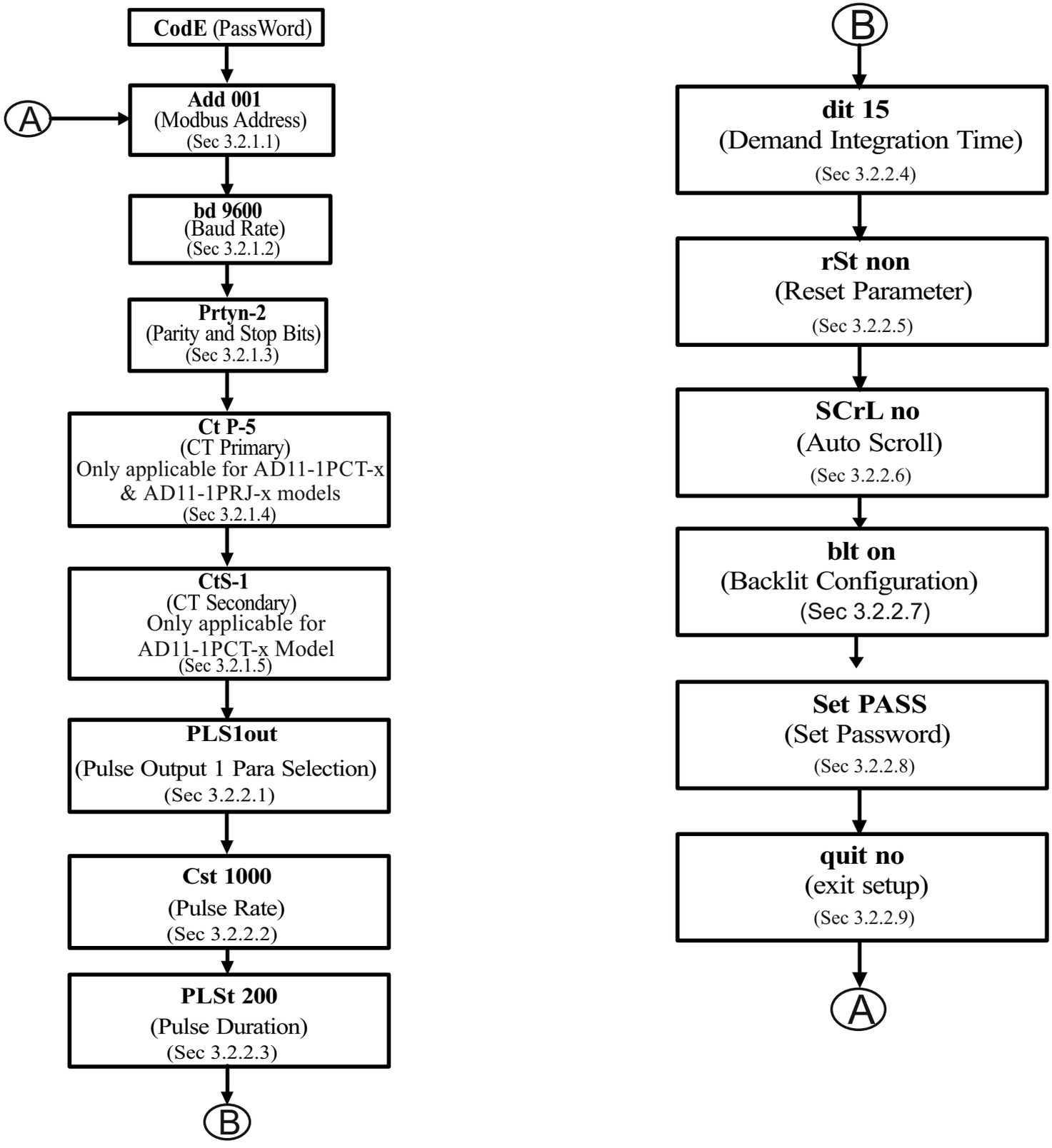
Screen 1

Parameter No.	Parameters	On Display	On Modbus
1	Total Active Energy	✓	✓
2	Import Active Energy	✓	✓
3	Export Active Energy	✓	✓
4	Import Reactive Energy	✓	✓
5	Export Reactive Energy	✓	✓
6	Total Reactive Energy	✓	✓
7	Total Apparent Energy	✓	✓
8	Partial Import Active Energy	✓	✓
9	Partial Export Active Energy	✓	✓
10	Partial Total Active Energy	✓	✓
11	Partial Import Reactive Energy	✓	✓
12	Partial Export Reactive Energy	✓	✓
13	Partial Total Reactive Energy	✓	✓
14	Partial Total Apparent Energy	✓	✓
15	Voltage	✓	✓
16	Current	✓	✓
17	Active Power	✓	✓
18	Reactive Power	✓	✓
19	Apparent Power	✓	✓
20	Power Factor	✓	✓
21	Frequency	✓	✓
22	Cst - xxxx	✓	✓
23	Add - xxx	✓	✓
24	bd - xxxx	✓	✓
25	Pd - Pd count of meter	✓	✓
26	Active tariff status	✓	✓
27	Serial Number	✓	✓
28	Display Test	✓	--

TABLE 1 : Measurement Parameters (contd.):
Screen 2

Parameter No.	Parameters	On Display	On Modbus
29	CRC of meter	✓	✓
30	T1 Import Active Energy	✓	✓
31	T1 Export Active Energy	✓	✓
32	T1 Total Active Energy	✓	✓
33	T1 Import Reactive Energy	✓	✓
34	T1 Export Reactive Energy	✓	✓
35	T1 Total Reactive Energy	✓	✓
36	T1 Total Apparent Energy	✓	✓
37	T2 Import Active Energy	✓	✓
38	T2 Export Active Energy	✓	✓
39	T2 Total Active Energy	✓	✓
40	T2 Import Reactive Energy	✓	✓
41	T2 Export Reactive Energy	✓	✓
42	T2 Total Reactive Energy	✓	✓
43	T2 Total Apparent Energy	✓	✓
44	Import W Max Demand	✓	✓
45	Export W Max Demand	✓	✓
46	Import VAr Max Demand	✓	✓
47	Export VAr Max Demand	✓	✓
48	Import VA Max Demand	✓	✓
49	Export VA Max Demand	✓	✓
50	Current Max Demand	✓	✓

2.3 Setup Parameters Screens Navigation Map



2.4 Measurement Parameters Screens



Total Active Energy



Import Active Energy



Export Active Energy



Import Reactive Energy



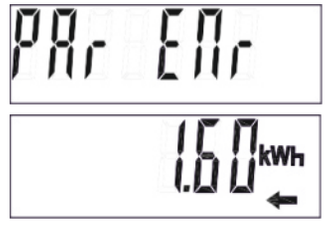
Export Reactive Energy



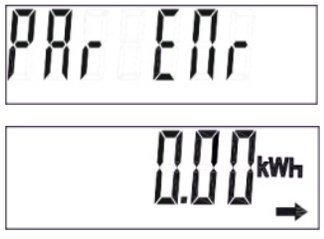
Total Reactive Energy



Total Apparent Energy



Partial Import Active Energy



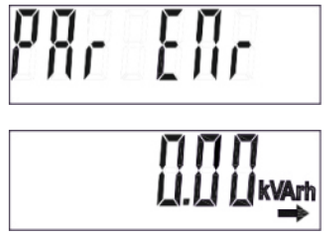
Partial Export Active Energy



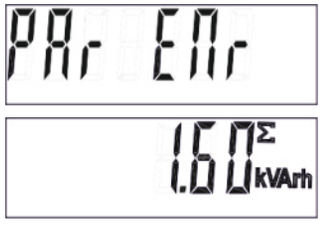
Partial Total Active Energy



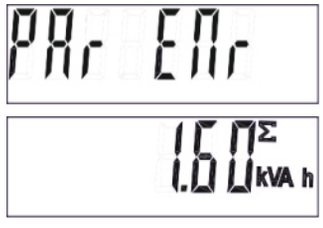
Partial Import Reactive Energy



Partial Export Reactive Energy



Partial Total Reactive Energy



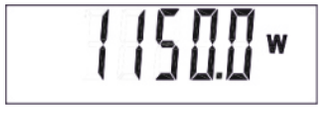
Partial Total Apparent Energy



Voltage



Current



Active Power



Reactive Power



Apparent Power



Power Factor



Frequency



Pulse Constant



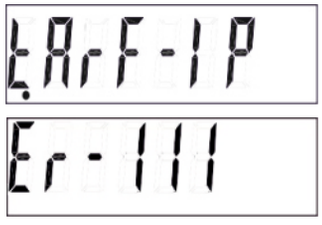
Modbus Device Address



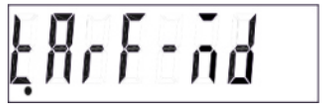
Baud Rate



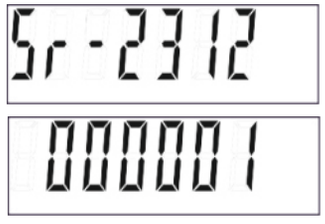
Power Drop



Tarrif Status-Input
Based & Error Indication



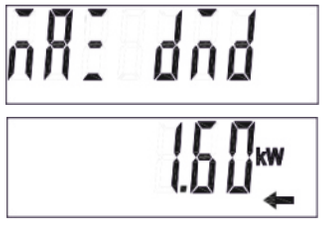
Tarrif Status-
Modbus Based



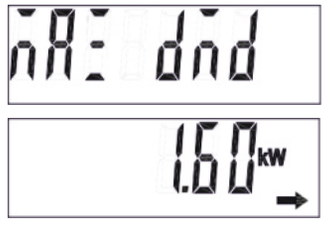
Serial Number



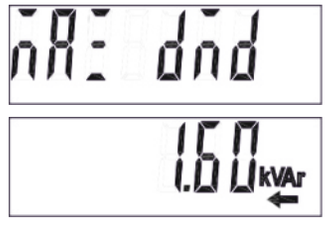
Display Check



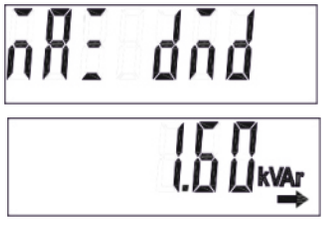
Import Active Power
Max Demand



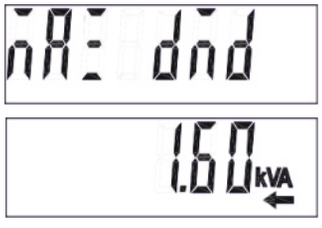
Export Active Power
Max Demand



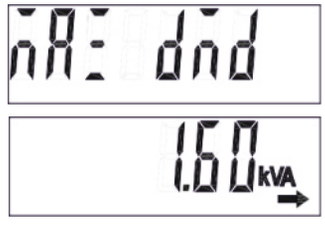
Import Reactive Power
Max Demand



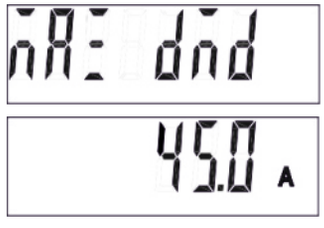
Export Reactive Power
Max Demand



Import Apparent Power
Max Demand



Export Apparent Power
Max Demand



Current
Max Demand

3. PROGRAMMING

The following sections comprise step by step procedures for configuring the Energy Meter according to individual user requirements. To access the set-up screens press and hold key for 5 seconds on any measurement parameter screen. This will take the User into the Password Protection Entry Stage (Section 3.1).

3.1 Password Protection

Password protection can be enabled to prevent unauthorized access to set-up screens, when default password protection is not enabled. Password protection is enabled by selecting a four digit number other than 0000, setting a password of 0000 disables the password protection.



Enter Password, prompt for first digit. Press the key to scroll the value of first digit from 0 through to 9, Press & Hold key to advance to next digit.



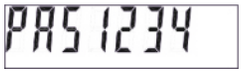
Enter Password, first digit entered, prompt for second digit..
Press the key to scroll the value of first digit from 0 through to 9
Press & Hold the key to advance to next digit.



Enter Password, second digit entered, prompt for third digit.
Press the key to scroll the value of first digit from 0 through to 9.
Press & Hold the key to advance to next digit.



Enter Password, third digit entered, prompt for fourth digit. .
Press the key to scroll the value of first digit from 0 through to 9.
Press & Hold the key to advance to verification of the password.



password confirmed and Pressing key advances to the “Setup Menu” entry stage. (See Section 3.2).

Password Incorrect.



When this Screen appears and first digit is blinking means the unit has not accepted the Password entered. it gives one more chance to enter the password and after this meter will quit setup menu.

3.2 Setup Menu selection

3.2.1 Communication Parameter Selection

3.2.1.1 Address Setting



This screen allows the user to set address for the meter. The allowable range of addresses for MODBUS is 1 to 247 and for MBUS is 1 to 250.
Press & Hold the key to set the address of meter.
pressing the key to advance to the “Baud Rate” setup screen.
Press & Hold the key to enter into edit mode, prompt for first digit.



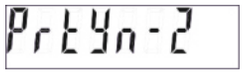
Press the keys to scroll the value of the first digit. Press & Hold the key to advance to next digit.
Similarly, enter second and third digits of address. After entering third digit, Press & Hold the key confirms the selection and shows “Done” screen.
The default setting is ‘*001*’.

3.2.1.2 Baud Rate



This screen allows the user to set Baud Rate. The values displayed on screen are in bits per second.
Pressing key accepts the present value and advance to the “Parity and Stop Bit Selection” screen (see Section 3.2.2.3).
Pressing & Holding the key advances to the “Baud Rate Edit” mode and pressing the scroll key scrolls the value through *2400, 4800, 9600, 19200 and 38400* baud for MODBUS and 300, 600, 1200, 2400, 4800 and 9600 baud for MBUS.
Pressing & Holding the key sets the value and shows the “Baud Rate” screen (see Section 3.2.1.2).
NOTE: Default value is set as ‘*9600*’.

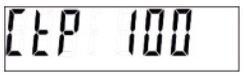
3.2.1.3 Parity and Stop Bit



This screen allows the user to set Parity & number of stop bits
Pressing the key accepts the present value and advances to “CT Primary Parameters” screen (see section 3.2.1.4)

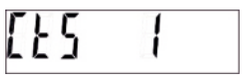
Pressing & Holding the key advances to the “Parity & Stop bit Edit” mode & pressing the keys scrolls the value through: *nonE1*: no parity with one stop bit, *nonE2*: no parity with two stop bit, *EVEn*: even parity with one stop bit, *odd*: odd parity with one stop bit.
For MBUS EVEn1: Even parity is setable.
Pressing & Holding the key sets the value and advances to “CT Primary” setup screen (see Section 3.2.1.4).
Default value for MODBUS is set as ‘*nonE1*’.

3.2.1.4 CT Primary (only apllicable for AD11-1PCT-x & AD11-1PRJ-x Models)



This screen allows the user to set CT Primary value for the meter. The valid range of value for AD11-1PCT-x is 1 - 1000 and for AD11-1PRJ-x is 5-1000.
Pressing key accepts the present value and advance to the “CT Secondary” setup screen.
Press and hold the key to enter into edit mode, prompt for first digit. Press the key to scroll the value of the first digit. Press and hold key to advance to next digit.
Similarly, enter second and third digits CT Primary value. After entering last digit, Pressing the key confirms the selection and shows “Done” screen.
The default setting is ‘5’.

3.2.1.5 CT Secondary (only applicable for AD11-1PCT-x Model)



This screen allows the user to set CT Secondary value for the meter. The option values of CT secondary are1 Ampere or 5 Ampere.
Press key to set the CT Secondary value .
Press and hold key to enter into edit mode. Pressing key again scrolls the value through 1A or 5A. confirms the selection by pressing key, then shows “Done” screen.
Pressing key sets the value and advances to “output parameter Selection” screen (see Section 3.2.2.).
The default setting is ‘5’.

3.2.2 Output Parameter Selection

3.2.2.1. Pulse Output



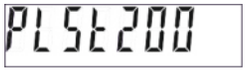
This screen is used to set the pulse1 ie SO1 output parameter.
Pressing key accept the current values and advances to “pulse rate Selection” menu.Pressing & Holding key advances to the “ pulse output 1 Parameter edit ” mode & pressing the key scrolls the value through: *IMP KWH, EXP KWH, IMP KVArh, EXP KVArh, IND KVArh, CAP KVArh.* , TOTAL KWH , TOTAL KVARH (see Table 3 on page 18)
Pressing & Holding the key sets the value and advances to “pulse rate selection” screen.
Default value is IMP KWH - *import kwh*

3.2.2.2. Pulse Rate



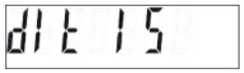
This screen applies to the Pulse Output option only. The screen allows user to set the following pulse rates: 1 pulse per 1 (1kWh) / 10 (1kWh) / 100 (1kWh) / 1000 (1kWh).
Pressing key accepts the present selection and takes to the “Pulse Duration Selection” menu (See section 3.2.2.3).
Pressing & Holding the key advances to “Pulse Rate Edit” mode & pressing the key will scrolls the value through the values *1, 10, 100 and 1000*.
Pressing & Holding the key set the value and advances to “Pulse Duration” screen (see Section 3.2.2.3).
The default setting is *‘1000’.*
NOTE: For AD11-1PCT-x SO pulse are always based on CT ratio 5/5 A and for AD11-1PRJ-x SO pulse are always based on CT Secondary 100mA.

3.2.2.3 Pulse Duration



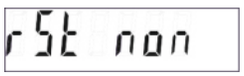
This screen applies only to the Pulse Output. This screen allows the user to set pulse Output energization time in milliseconds.
Pressing the key accepts the present value and advance to “Demand integration time” screen (see section 3.2.2.4).
Pressing & Holding the key advances to “Pulse Duration Edit” mode and pressing the key scroll the value through *60, 100 and 200* miliseconds.
Pressing & Holding the key selects the value and advances to “Demand integration time” menu (see Section 3.2.2.4).
Default value is set to ‘*200*’ ms.

3.2.2.4 Demand Integration Time



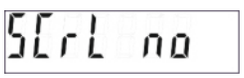
This screen is used to set the period over which current and power readings are to be integrated. The Unit of displayed value is minutes.
Pressing the key accepts the present value and advance to “Reset Parameter” screen.
Pressing & Holding the key advances to “Demand integration time Edit” mode and pressing the key scroll the value through *5,10,15,30 minutes*.
Pressing & Holding the key selects the value and advances to “Reset Parameter” menu (see Section 3.2.2.5).
Default value is set to ‘*15’minute.*

3.2.2.5 Reset Parameter Selection



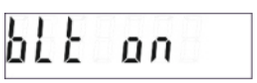
This screen is used to reset different parameters.
Pressing the key accepts the present value and advance to “Auto Scroll” screen.Pressing & Holding the key advances to “Reset Parameter Edit” mode and pressing the keys scroll through *none,* partial energy, demand, power down counter and all .
Pressing the enter key selects the value and advances to “Auto scroll” menu (see Section 3.2.2.6).

3.2.2.6 Auto Scrolling



This screen allows user to enable auto screen scrolling.
Pressing the key accepts the present status and advance to the “backlit configuration ”screen (see Section 3.2.2.7).
Pressing & Holding the key advances to “Auto scroll Edit” mode and pressing the key scroll through no,*10, 20, 30 sec.*
No - Auto scroll is disabled
10,20,30 - Autoscroll activated and number here displays Time in seconds between two screens in autoscroll. Pressing & Holding the key selects the value and advances to “backlit configuration” menu (see Section 3.2.2.7).

3.2.2.7 Backlit Configuration



This screen allows user to set backlit configuration.
Pressing the key accepts the present status and advance to the “Change Password ”screen (see Section 3.2.2.8).
Pressing & Holding the key advances to “backlit configuration edit” mode and pressing the key scroll through on, off, *act.*
1)on - backlit set to continues on mode.
2)off-backlit set to continues off mode. 3)act - backlit set to on for 10 Sec. when user press the key. Pressing & Holding the key selects the value and advances to “Change Password” menu (see Section 3.2.2.8).

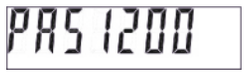
3.2.2.8 New / Change Password



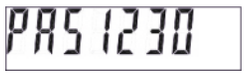
This screen allows user to set password screen scrolling.
Pressing & Holding the key accepts the present status and advance to the “quit screen” screen (see Section 3.2.2.9).



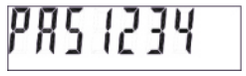
Pressing & Holding the key advances to “Set password Edit” mode and
pressing the key scroll the value of first digit from 0 through to 9.



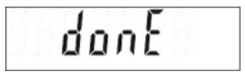
Pressing & Holding the key selects the value and advances to set second digit.
pressing the key scroll the value of second digit from 0 through to 9.



Pressing & Holding the key selects the value and advances to set third digit.
pressing the key scroll the value of third digit from 0 through to 9.

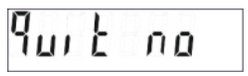


Pressing & Holding the key selects the value and advances to set forth digit.
pressing the key scroll the value of fourth digit from 0 through to 9.



Pressing & Holding the key selects the value and advances to Password conformation.

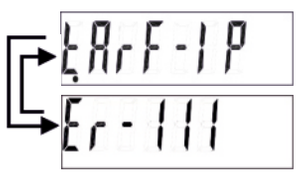
3.2.2.9 Quit Setup Menu



This screen allows user to Exit from Setup Menu.
Pressing & Holding the key advances to “quit setup” edit mode
pressing the key scroll the options yes or no.
Pressing & Holding the key will conforms the selection.
if YES selected then meter will quit from setup, selecting the NO option it will advanced to address setup screen (see Section 3.2.1.1).

4. Troubleshooting

4.1 Error Screen



The Error Screen is designed to display error codes in the format "Er-XXX". Each digit in the error code represents a specific type of error. The first digit indicates a program flash CRC mismatch error, the second digit signifies an EEPROM full or error, and the third digit represents a calibration error. If any of these errors occur, the corresponding digit changes from 0 to 1. For instance, if a program flash CRC mismatch error occurs, the error code displayed will be "Er-100" or if a program EEPROM gets full or malfunction, the error code displayed will be "Er-010". Conversely, if no errors are detected, the screen will display "Er-000". This clear and concise error indication system ensures efficient troubleshooting and maintenance of the energy meter. This screen is multiplexed with Tariff Input Screen and will toggle back and forth.

NOTE: If any of the above errors occurs, please contact technical support

5. Tariff Selection :

The meter is provided Tariff Selection Via Tariff Inputs or Modbus or MBus for selection of active tariff respectively for energy meter

5.1 Tariff Selection:

Relationship between Tariff Input and ActiveTariff

Tariff Input 1	Tariff number
LOW	Tariff 1
HIGH	Tariff 2

6. SO Output :

The Meter is provided with one opto-isolated pulse outputs that can be configured for any one of the Active, Reactive and Apparent Energy parameters. Refer TABLE 3 for parameters for pulse output. The pulse width and rate of pulse out is onsite programmable .

6.1 Pulse Output :

Pulse Output is opto-coupler based SO which can be used to drive an external mechanical counter for energy measurement. The Pulse Output can be configured to the parameters mentioned in TABLE 3 through setup parameter screen.

TABLE 3 : Parameters for Pulse Output

Parameter Number	Parameter	1P 2W
1	Import Active Energy	✓
2	Export Active Energy	✓
3	Import Reactive Energy	✓
4	Export Reactive Energy	✓
5	Inductive Reactive Energy	✓
6	Capacitive Reactive Energy	✓
7	Total active energy	✓
8	Total kvarh energy	✓

7. RS 485 (ModBus) Output :

The Energy Meter supports MODBUS (RS485) RTU protocol (2-wire) .

Connection should be made using twisted pair shielded cable. All "A" and "B" connections are daisy chained together.Loop (ring) topology does not require any termination load. Line topology may or may not require terminating loads depending on the type and length of cable used. The impedance of the termination load should match the impedance of the cable and be at both ends of the line. The cable should be terminated at each end with a 120 ohm (1/4 Watt min.) resistor.

RS 485 network supports maximum length of 1.2km. Including the Master, a maximum of 32 instruments can be connected in RS485 network. The permissible address range for The Meter is between 1 and 247 for 32 instruments. Broadcast Mode (address 0) is not allowed.

Each byte in RTU mode has following format:

	8-bit binary, hexadecimal 0-9, A-F 2 hexadecimal characters contained in each 8-bit field of the message
Format of Data Bytes	4 bytes (32 bits) per parameter. Floating point format (to IEEE 754) Most significant byte first (Alternative least significant byte first)
Error Checking Bytes	2 byte Cyclical Redundancy Check (CRC)
Byte format	1 start bit, 8 data bits, least significant bit sent first 1 bit for even/odd parity 1 stop bit if parity is used; 1 or 2 bits if no parity

Communication Baud Rate is user selectable from the front panel between 2400,4800,9600,19200,38400 bps.

Function code :

03 (HEX)	Read Holding Registers	Read content of read /write location (4X)
04 (HEX)	Read input Registers	Read content of read only location (3X)
10 (HEX)	Presets Multiple Registers	Set the content of read / write locations (4X)

Exception Cases : An exception code will be generated when Meter receives ModBus query with valid parity & error check but which contains some other error (e.g. Attempt to set floating point variable to an invalid value) The response generated will be “Function Code” ORed with HEX (80H). The exception codes are listed below

01	Illegal function	The function code is not supported by Meter
02	Illegal Data Address	Attempt to access an invalid address or an attempt to read or write part of a floating point value
03	Illegal DataValue	Attempt to set a floating point variable to an invalid value

7.1 Accessing 3X and 4X register for reading measured values:

Two consecutive 16 bit registers represent one parameter. Refer **TABLE** 4 for the addresses of 3X and 4X registers used for parameters measured by the instrument. Each parameter is held in the 3X as well as 4X registers. Modbus Code 03 and 04 are used to access all parameters in 3X and 4X registers respectively.

Example :
To read parameter,
Voltage from 3X: Start address= 00 00 Number of registers = 02
Current from 4X: Start address= 00 06 Number of registers = 02

Note : Number of registers = Number of parameters x 2

Each query for reading the data must be restricted to 40 parameters or less. Exceeding the 40 parameter limit will cause a ModBus exception code to be returned.

Query for 3X read:

01 (Hex)	04 (Hex)	00 (Hex)	00(Hex)	00 (Hex)	02(Hex)	71 (Hex)	CB (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Lo	CRC Low	CRC High

3X Response: Voltage (230V)

01 (Hex)	04(Hex)	04 (Hex)	43 (Hex)	66 (Hex)	00 (Hex)	00 (Hex)	0E (Hex)	1F (Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Byte Count : Total number of data bytes received.

Query for 4X read:

01 (Hex)	03(Hex)	00 (Hex)	06(Hex)	00 (Hex)	02(Hex)	24 (Hex)	0A (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Lo	CRC Low	CRC High

4X Response: Current (5 A)

01 (Hex)	03 (Hex)	04 (Hex)	40 (Hex)	A0 (Hex)	00 (Hex)	00 (Hex)	EF (Hex)	D1(Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Byte count : No. of Bytes Demanded by user in query.
Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address low : Least significant 8 bits of starting address of the parameter requested.
Number of register Hi : Most significant 8 bits of Number of registers requested.
Number of register Lo : Least significant 8 bits of Number of registers requested.
Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.
(Note : Two consecutive 16 bit register represent one parameter.)

TABLE 4 : 3 X and 4 X register addresses for measured parameters

Address (3X)	Address (4X)	Parameter Number	Parameter	Units	Hex Address	
					High Byte	Low Byte
30001	40001	0	Voltage	Volts	00	00
30003	40003	1	-	-	00	02
30005	40005	2	-	-	00	04
30007	40007	3	Current	Amp	00	06
30009	40009	4	-	-	00	08
30011	40011	5	-	-	00	0A
30013	40013	6	Active Power	W	00	0C
30015	40015	7	-	-	00	0E
30017	40017	8	-	-	00	10
30019	40019	9	Apparent Power	VA	00	12
30021	40021	10	-	-	00	14
30023	40023	11	-	-	00	16
30025	40025	12	Reactive Power	VAr	00	18
30027	40027	13	-	-	00	1A

TABLE 4 : Continued

Address (3X)	Address (4X)	Parameter Number	Parameter	Units	Hex Address	
					High Byte	Low Byte
30029	40029	14	-	-	00	1C
30031	40031	15	Power Factor	-	00	1E
30033	40033	16	-	-	00	20
30035	40035	17	-	-	00	22
30037	40037	18	-	-	00	24
30071	40071	35	Freqency	Hz	00	46
30073	40073	36	W Import Demand	W	00	48
30075	40075	37	W Import Max Demand	W	00	4A
30077	40077	38	W Export Demand	W	00	4C
30079	40079	39	W Exp. Max Demand	W	00	4E
30081	40081	40	var Imp.\ Ind Demand	VAr	00	50
30083	40083	41	var Imp.\ Ind Max Demand	VAr	00	52
30085	40085	42	var Exp. \ Cap Max Demand	VAr	00	54
30087	40087	43	var Exp. \ Cap Max Demand	VAr	00	56
30089	40089	44	va Imp. Demand	VA	00	58
30091	40091	45	va Imp. Max Demand	VA	00	5A
30093	40093	46	va Exp. Demand	VA	00	5C
30095	40095	47	va Exp. Max Demand	VA	00	5E
30097	40097	48	Current Imp. Demand	Amp	00	60
30099	40099	49	Current Imp Max. Demand	Amp	00	62
30101	40101	50	-	-	00	64
30103	40103	51	-	-	00	66
30105	40105	52	-	-	00	68
30107	40107	53	Active Import Energy Overflow Count	-	00	6A
30109	40109	54	Active Import Energy	kWh	00	6C
30111	40111	55	Active Export Energy Overflow Count	-	00	6E
30113	40113	56	Active Export Energy	kWh	00	70
30115	40115	57	Reactive Import Energy Overflow Count	-	00	72
30117	40117	58	Reactive Import Energy	kVArh	00	74
30119	40119	59	Reactive Export Energy Overflow Count	-	00	76
30121	40121	60	Reactive Export Energy	kVArh	00	78
30123	40123	61	Total Apparent Energy Overflow Count	-	00	7A
30125	40125	62	Total Apparent Energy	kVAh	00	7C
30127	40127	63	-	-	00	7E
30129	40129	64	-	-	00	80

TABLE 4 : Continued

Address (3X)	Address (4X)	Parameter Number	Parameter	Units	Hex Address	
					High Byte	Low Byte
30131	40131	65	Total Active Energy Overflow Count	-	00	82
30133	40133	66	Total Active Energy	kWh	00	84
30135	40135	67	Total Reactive Energy Overflow Count	-	00	86
30137	40137	68	Total Reactive Energy	kVArh	00	88
30139	40139	69	Total Apparent Energy Overflow Count	-	00	8A
30141	40141	70	Total Apparent Energy	kVAh	00	8C
30143	40143	71	T1 Active Import Energy Overflow Count	-	00	8E
30145	40145	72	T1 Active Import Energy	kWh	00	90
30147	40147	73	T1 Active Export Energy Overflow Count	-	00	92
30149	40149	74	T1 Active Export Energy	kWh	00	94
30151	40151	75	T1 Reactive Import Energy Overflow Count	-	00	96
30153	40153	76	T1 Reactive Import Energy	kVArh	00	98
30155	40155	77	T1 Reactive Export Energy Overflow Count	-	00	9A
30157	40157	78	T1 Reactive Export Energy	kVArh	00	9C
30159	40159	79	T1 Total Apparent Energy Overflow Count	-	00	9E
30161	40161	80	T1 Total Apparent Energy	kVAh	00	A0
30163	40163	81	-	-	00	A2
30165	40165	82	-	-	00	A4
30167	40167	83	T1 Total Active Energy Overflow Count	-	00	A6
30169	40169	84	T1 Total Active Energy	kWh	00	A8
30171	40171	85	T1 Total Reactive Energy Overflow Count	-	00	AA
30173	40173	86	T1 Total Reactive Energy	kVArh	00	AC
30175	40175	87	T1 Total Apparent Energy Overflow Count	-	00	AE
30177	40177	88	T1 Total Apparent Energy	kVAh	00	B0
30179	40179	89	T2 Active Import Energy Overflow Count	-	00	B2
30181	40181	90	T2 Active Import Energy	kWh	00	B4
30183	40183	91	T2 Active Export Energy Overflow Count	-	00	B6
30185	40185	92	T2 Active Export Energy	kWh	00	B8
30187	40187	93	T2 Reactive Import Energy Overflow Count	-	00	BA
30189	40189	94	T2 Reactive Import Energy	kVArh	00	BC
30191	40191	95	T2 Reactive Export Energy Overflow Count	-	00	BE
30193	40193	96	T2 Reactive Export Energy	kVArh	00	C0
30195	40195	97	T2 Total Apparent Energy Overflow Count	-	00	C2
30197	40197	98	T2 Total Apparent Energy	kVAh	00	C4
30199	40199	99	-	-	00	C6

TABLE 4 : Continued

Address (3X)	Address (4X)	Parameter Number	Parameter	Units	Hex Address	
					High Byte	Low Byte
30201	40201	100	-	-	00	C8
30203	40203	101	T2 Total Active Energy Overflow Count	-	00	CA
30205	40205	102	T2 Total Active Energy	kWh	00	CC
30207	40207	103	T2 Total Reactive Energy Overflow Count	-	00	CE
30209	40209	104	T2 Total Reactive Energy	kVArh	00	D0
30211	40211	105	T2 Total Apparent Energy Overflow Count	-	00	D2
30213	40213	106	T2 Total Apparent Energy	kVAh	00	D4
30215	40215	107	Partial Active Import Energy Overflow Count	-	00	D6
30217	40217	108	Partial Active Import Energy	Wh	00	D8
30219	40219	109	Partial Active Export Energy Overflow Count	-	00	DA
30221	40221	110	Partial Active Export Energy	kWh	00	DC
30223	40223	111	Partial Reactive Import Energy Overflow Count	-	00	DE
30225	40225	112	Partial Reactive Import Energy	kVArh	00	E0
30227	40227	113	partial Reactive Export Energy Overflow Count	-	00	E2
30229	40229	114	Partial Reactive Export Energy	kVArh	00	E4
30231	40231	115	Partial Total Apparent Energy Overflow Count	-	00	E6
30233	40233	116	Partial Total Apparent Energy	kVAh	00	E8
30235	40235	117	-	-	00	EA
30237	40237	118	-	-	00	EC
30239	40239	119	Partial Total Active Energy Overflow Count	-	00	EE
30241	40241	120	Partial Total Active Energy	kWh	00	F0
30243	40243	121	Partial Total Reactive Energy Overflow Count	-	00	F2
30245	40245	122	Partial Total Reactive Energy	kArh	00	F4
30247	40247	123	Partial Total Apparent Energy Overflow Count	-	00	F6
30249	40249	124	Partial Total Apparent Energy	kVAh	00	F8
30251	40251	125	-	-	00	FA
30253	40253	126	-	-	00	FC
30255	40255	127	No of Interrupts	-	00	FE
30257	40257	128	Impulse Rate	-	01	00
30259	40259	129	-	-	01	02
30261	40261	130	Tarrif Status		01	04
30263	40263	131	Current Direction	Amp	01	06

Note: In Current Direction address if 0 is shown then current is in right direction i.e.Iin and Iout at current are matching with the terminals marked. if this address shows 1 then current is in reversed direction.

TABLE 5 : 3 X long register addresses for measured parameters

Address (3X)	Parameter Number	Parameter	Units	Hex Address	
				High Byte	Low Byte
30513	1	Wh Import Overflow Count	-	02	00
30515	2	Wh Import	kWh	02	02
30517	3	Wh Export Overflow Count	-	02	04
30519	4	Wh Export	kWh	02	06
30521	5	Varh Import Overflow Count	-	02	08
30523	6	Varh Import	kVArh	02	0A
30525	7	Varh Export Overflow Count	-	02	0C
30527	8	Varh Export	kVArh	02	0E
30529	9	Vah Import Overflow Count	-	02	10
30531	10	Vah Import	kVAh	02	12
30533	11	Vah Export Overflow Count	-	02	14
30535	12	Vah Export	kVAh	02	16
30537	13	Total Active Energy Overflow Count	-	02	18
30539	14	Total Active Energy	kWh	02	1A
30541	15	Total Reactive Energy Overflow Count	-	02	1C
30543	16	Total Reactive Energy	kVArh	02	1E
30545	17	Total Apparent Energy Overflow Count	-	02	20
30547	18	Total Apparent Energy	kVAh	02	22
30549	19	T1 Wh Import Overflow Count	-	02	24
30551	20	T1 Wh Import	kWh	02	26
30553	21	T1 Wh Export Overflow Count	-	02	28
30555	22	T1 Wh Export	kWh	02	2A
30557	23	T1 Varh Import Overflow Count	-	02	2C
30559	24	T1 Varh Import	kVArh	02	2E
30561	25	T1 Varh Export Overflow Count	-	02	30
30563	26	T1 Varh Export	kVArh	02	32
30565	27	T1 Vah Import Overflow Count	-	02	34
30567	28	T1 Vah Import	kVAh	02	36
30569	29	T1 Vah Export Overflow Count	-	02	38
30571	30	T1 Vah Export	kVAh	02	3A
30573	31	T1 Total Active Energy Overflow Count	-	02	3C
30575	32	T1 Total Active Energy	kWh	02	3E
30577	33	T1 Total Reactive Energy Overflow Count	-	02	40
30579	34	T1 Total Reactive Energy	kVArh	02	42
30581	35	T1 Total Apparent Energy Overflow Count	-	02	44
30583	36	T1 Total Apparent Energy	kVAh	02	46

TABLE 5 : Continued

Address (3X)	Parameter Number	Parameter	Units	Hex Address	
				High Byte	Low Byte
30585	37	T2 Wh Import Overflow Count	-	02	48
30587	38	T2 Wh Import	kWh	02	4A
30589	39	T2 Wh Export Overflow Count	-	02	4C
30591	40	T2 Wh Export	kWh	02	4E
30593	41	T2 Varh Import Overflow Count	-	02	50
30595	42	T2 Varh Import	kVArh	02	52
30597	43	T2 Varh Export Overflow Count	-	02	54
30599	44	T2 Varh Export	kVArh	02	56
30601	45	T2 Vah Import Overflow Count	-	02	58
30603	46	T2 Vah Import	kVAh	02	5A
30605	47	T2 Vah Export Overflow Count	-	02	5C
30607	48	T2 Vah Export	kVAh	02	5E
30609	49	T2 Total Active Energy Overflow Count	-	02	60
30611	50	T2 Total Active Energy	kWh	02	62
30613	51	T2 Total Reactive Energy Overflow Count	-	02	64
30615	52	T2 Total Reactive Energy	kVArh	02	66
30617	53	T2 Total Apparent Energy Overflow Count	-	02	68
30619	54	T2 Total Apparent Energy	kVAh	02	6A
30621	55	Par Wh Import Overflow Count	-	02	6C
30623	56	Par Wh Import	kWh	02	6E
30625	57	Par Wh Export Overflow Count	-	02	70
30627	58	Par Wh Export	kWh	02	72
30629	59	Par Varh Import Overflow Count	-	02	74
30631	60	Par Varh Import	kVArh	02	76
30633	61	Par Varh Export Overflow Count	-	02	78
30635	62	Par Varh Export	kVArh	02	7A
30637	63	Par Vah Import Overflow Count	-	02	7C
30639	64	Par Vah Import	kVAh	02	7E
30641	65	Par Vah Export Overflow Count	-	02	80
30643	66	Par Vah Export	kVAh	02	82
30645	67	Par Total Active Energy Overflow Count	-	02	84
30647	68	Par Total Active Energy	kWh	02	86
30649	69	Par Total Reactive Energy Overflow Count	-	02	88
30651	70	Par Total Reactive Energy	kVArh	02	8A
30653	71	Par Total Apparent Energy Overflow Count	-	02	8C
30655	72	Par Total Apparent Energy	kVAh	02	8E

NOTE: Energy Overflow count Increments when energy count exceeds 99999.999.

Overflow	Display Energy
< 1	99999.99
< 10	999999.9
> =10	9999999

7.2 Accessing 3 X register for Long Energy Reading :

For Reading Energy start count in long energy format following query format should be used

Query: (Query for Reading Active Energy Import Overflow)

Device Address	01 (Hex)
Function Code	04 (Hex)
Starting Address High	02 (Hex)
Starting Address Low	00 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
Byte Count	04 (Hex)
Data Register- 1 High Byte	40 (Hex)
Data Register- 1 Low Byte	80 (Hex)
Data Register- 2 High Byte	00 (Hex)
Data Register- 2 Low Byte	00 (Hex)
CRC Low	BE (Hex)
CRC High	A7 (Hex)

Byte Count : Total number of data bytes transmitted.

Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.

Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.

Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.

Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Response:

Device Address	01 (Hex)
Function Code	04 (Hex)
Start Address High	02 (Hex)
Start Address Low	00 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
CRC Low	70 (Hex)
CRC High	73 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.

Start Address Low : Least significant 8 bits of starting address of the parameter requested.

Number of register High : Most significant 8 bits of Number of registers requested.

Number of register Low : Least significant 8 bits of Number of registers requested.

7.3 Accessing 4 X register for Reading & Writing Settings:

Each setting is held in the 4X registers. ModBus code 04 is used to read the parameters. Refer **TABLE 6** for 4X Register addresses.

Example: Reading Total Energy Counter Formula

Start address = 1776 (Hex)
Number of registers = 02
Note: Number of registers = Number of Parameters x 2

Query :

Device Address	01 (Hex)
Function Code	03 (Hex)
Start Address High	17 (Hex)
Start Address Low	76 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
CRC Low	20 (Hex)
CRC High	65 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address Low : Least significant 8 bits of starting address of the parameter requested.
Number of register High : Most significant 8 bits of Number of registers requested.
Number of register Low : Least significant 8 bits of Number of registers requested.
(Note : Two consecutive 16 bit register represent one parameter.)

Response: Total Energy Counter Formula 1

Device Address	01 (Hex)
Function Code	03 (Hex)
Byte Count	04 (Hex)
Data Register- 1 High Byte	3F(Hex)
Data Register- 1 Low Byte	80 (Hex)
Data Register- 2 High Byte	00 (Hex)
Data Register- 2 Low Byte	00 (Hex)
CRC Low	F7 (Hex)
CRC High	CF (Hex)

Byte Count : Total number of data bytes received.
Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.
(Note : Two consecutive 16 bit register represent one parameter.)

Example : Writing Total Energy Counter Formula

Counter Formula : 2 Start address = 1776 (Hex)
Number of registers = 02
Note: Number of registers = Number of Parameters x 2

Query:

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address High	17 (Hex)
Starting Address Low	76 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
Byte Count	04 (Hex)
Data Register- 1 High Byte	40 (Hex)
Data Register- 1 Low Byte	00 (Hex)
Data Register- 2 High Byte	00 (Hex)
Data Register- 2 Low Byte	00 (Hex)
CRC Low	8A (Hex)
CRC High	91 (Hex)

Byte Count : Total number of data bytes received.
Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.
(Note : Two consecutive 16 bit register represent one parameter)

Response:

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	17 (Hex)
Start Address Low	76 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
CRC Low	A5 (Hex)
CRC High	A6 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address Low : Least significant 8 bits of starting address of the parameter requested.
Number of register High : Most significant 8 bits of Number of registers requested.
Number of register Low : Least significant 8 bits of Number of registers requested.
(Note : Two consecutive 16 bit register represent one parameter)

TABLE 6 : 4 X register addresses

Parameter No.	Address Register	Parameters	Default Values
1	46001	-	-
2	46003	Demand Integration Time	15
3	46005	-	-
4	46007	Total Energy Counter Formula	3
5	46009	Import/Export Reactive Energy Counter Formula	1
6	46011	Nominal voltage	230
7	46013	Nominal Current	Rated Current
8	46015	Nominal Frequency	50
9	46017	Reset Parameters	0
10	46019	Setup change Count	0
11	46021	-	-
12	46023	Tariff Configuration	1
13	46025	Modbus Address	1
14	46027	Comsetup Address	9
15	46029	-	-
16	46031	Autoscroll	0
17	46033	Backlit Configuration	1
18	46035	Password	0000
19	46037	So1 Pulse Constant	1000
20	46039	So1 Pulse Parameters	1
21	46041	So1 Pulse Width	200
22	46043	-	-
23	46045	-	-
24	46047	-	-

4 X register addresses for AD11-1P45-x models

Parameter No.	Address Register	Parameters	Default Values
25	46049	-	-
26	46051	-	-
27	46053	Version Number	XX.XX
28	46055	Serial Number Year Date	YYMM
29	46057	Serial Number Data	-
30	46059	CRC Flash	-
31	46061	Error bit Address	-
32	46063		-

4 X register addresses for AD11-1PCT-x & AD11-1PRJ-x models

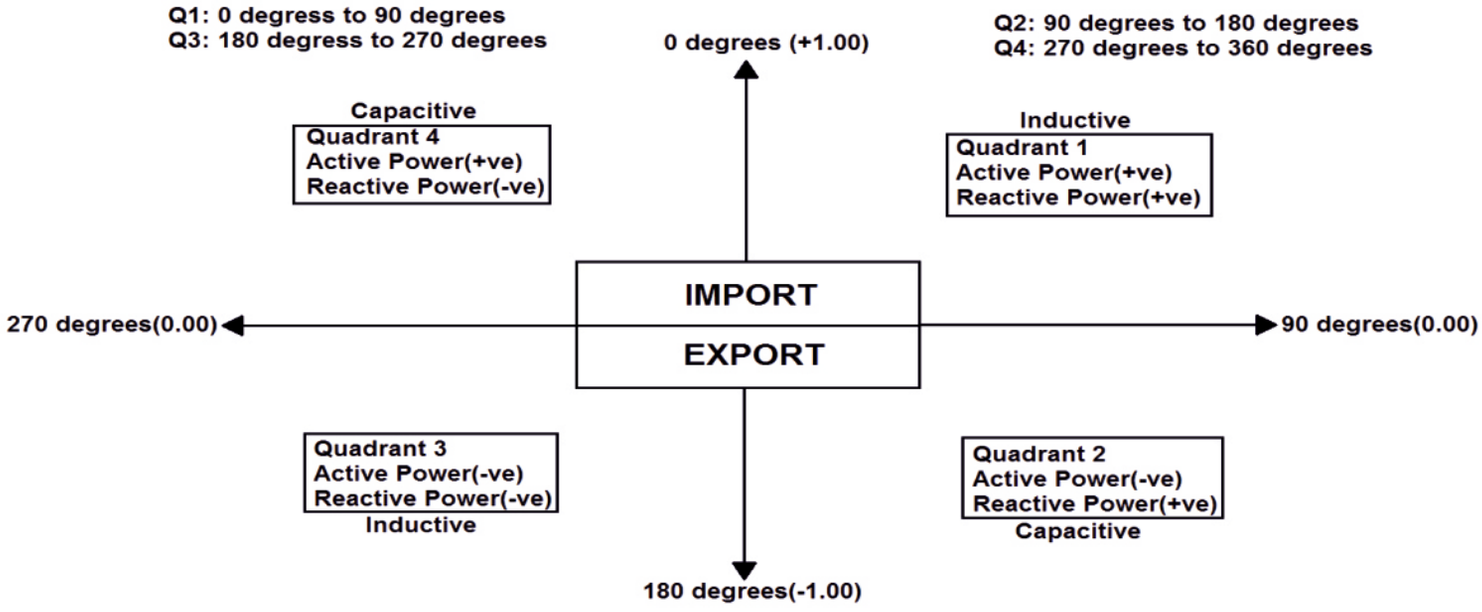
Parameter No.	Address Register	Parameters	Default Values
25	46049	CT Primary	5
26	46051	CT Secondary	5
27	46053	-	-
28	46055	-	-
29	46057	-	-
30	46059	-	-
31	46061	-	-
32	46063	-	-
33	46065	Version Number	XX.XX
34	46067	Serial Number Year Date	YYMM
35	46069	Serial Number Data	-
36	46071	CRC Flash	-
37	46073	Error bit Address	-
38	46075	-	-

TABLE 7 : 4 X register addresses Description

Parameter No.	Address Register	Parameters	Description
1	46001	-	-
2	46003	Demand Integration Time (Read\Write)	Demand Period represents demand time in minutes The Applicable values are 5, 10, 15, 30.
3	46005	-	-
4	46007	Total Energy counter formula (for Active & Reactive energy) (Read\Write)	This address allow to setup total energy measurement modes. Valid values are: 1:Total Energy = Import only, 2:Total Energy = Export only, 3.Total Energy = Imp+Export (for Import/Export Reactive energy refer 46009 setting)
5	46009	Import/Export Reactive Energy / Demand counter formula (Read\Write)	This address allow to setup reactive energy measurement Modes. Valid values are: 1: Import/Export i.e. Import KVARh = Import energy of Q1+Q2 and Export KVARh = Export energy of Q3+Q4, 2: Inductive/Capacitive i.e. Import KVARh = Import energy of Q1+Q3 and Export KVARh = Export energy of Q2+Q4 (refer to figure 1 page no. 34 for more detail).
6	46011	Nominal voltage (Read)	In this address nominal Voltage is set 230V by default.
7	46013	Nominal Current (Read)	In this address Rated Current will be Shown.
8	46015	Nominal Frequency (Read)	In this address nominal Frequency is set 50Hz by default.
9	46017	Reset Parameters (Read\Write)	This address allows the user to reset Parameter the valid values are 0: None, 1: Partial Energy, 2: Demand, 3: Power Drop, 4: all.
10	46019	Setup Change Count (Read)	Setup change count is increases only if below parameters are changed 1.Demand Integration Time 2.Total Energy Counter Formula 3.Import/Export Reactive Energy / Demand Counter Formula 4.Tariff Configuration 5.AutoScroll 6.Backlite Configuration 7.Password 8.Pulse Constant 9.Pulse Parameters 10.Pulse Width 11.CT Primary 12.CT Secondary.
11	46021	-	-
12	46023	Tariff Configuration (Read\Write)	This address allows user to configure the tarrif input wheather if it is setup from modbus or tariff inputs.The Valid Values are 1: Tariff Input Based 2: Tarrif 1 3: Tarrif 2.

TABLE 7 : Continued

Parameter No.	Address Register	Parameters	Description
13	46025	Modbus Address (Read\Write)	This register address is used to set device address between 1 to 247.
14	46027	Comsetup Address (Read\Write)	This register address is used to setup Rs485 communication parameters like baud rate , parity stop bit. the valid values are in between 0 to 19 (refer table 8 no. for details of baud rate and parity stop bit.
15	46029	-	-
16	46031	Autoscroll (Read\Write)	This address is used to setup autoscroll feature the valid values are 0 for No and 10, 20, 30 seconds.
17	46033	Backlit (Read\Write)	This address is used to setup backlit configuration. Valid values are 0: backlit set to continuous off, 1: backlit set to continuous on and 2: backlit on when key is pressed
18	46035	Password (Read\Write)	This Address is used to set & Reset the Password Valid Range of Password can be set is 0000-9999. 1)if password lock is present & if this location is read it will return zero 2)if password lock is present & to disable this lock first send valid password to this location then write “0000” to this location 3)if password lock is present & to modify 4X parameter first send valid password to this to this location so that 4X parameter will be accessible for modification. 4) if for in any of the above case invalid password is send then meter will return exception error 2
19	46037	So1 Pulse Constant (Read\Write)	This address is used to set desired pulse rate for 1 Kwh of SO1 output. The valid Values are 1,10,100,1000.
20	46039	So1 Pulse Parameters (Read\Write)	This address is used to select parameter for S01 output the valid values in between 1 to 8. refer table 3 for parmeters
21	46041	So1 Pulse Width (Read\Write)	This address allows the user to set the pulse duration of S01 output the valid values are 60, 100, 200 in ms.
22	46043	-	-
23	46045	-	-
24	46047	-	-



NOTE : If import export energy formula is selected (ie.46009=1) then for reactive demand and energy import term is representing import values (Q1+Q2) and export term representes export values (Q3+Q4)

If inductive capacitive energy formula is selected (ie.46009=2) then for reactive demand and energy import term is representing inductive values (Q1+Q3) and export term representes capacitive values (Q2+Q4)

Figure 1: Power Quadrant Diagram

4 X register addresses Description for AD11-1P45-x models

Parameter No.	Address Register	Parameters	Description
25	46049	-	-
26	46051	-	-
27	46053	Version Number (Read)	This address reads only firmware version of meter.
28	46055	Serial Number Year Date (Read)	This address shows the serial number of meter in Year and Month format
29	46057	Serial Number Data (Read)	-
30	46059	CRC Flash (Read)	-
31	46061	Error bit Address (Read)	This address shows the error bit
32	46063	Show/Hide leading zeros (Read/Write)	This address allow to show/hide leading zeros. Valid values are 0: hide leading zeros of energy counter and 1: show leading zeros of energy counter.

4 X register addresses Description for AD11-1PCT-x & AD11-1PRJ-x models

Parameter No.	Address Register	Parameters	Description
25	46049	CT Primary (Read)	This address shows the CT Primary value of meter
26	46051	CT Secondary (Read)	This address shows the CT Secondary value of meter
27	46053	-	-
28	46055	-	-
29	46057	-	-
30	46059	-	-
31	46061	-	-
32	46063	-	-
33	46065	Version Number (Read)	This address reads only firmware version of meter
34	46067	Serial Number Year Date (Read)	This address shows the serial number of meter in Year and Month format
35	46069	Serial Number Data (Read)	-
36	46071	CRC Flash (Read)	-
37	46073	Error bit Address (Read)	This address shows the error bit
38	46075	Show/Hide leading zeros (Read)	This address allow to show/hide leading zeros. Valid values are 0: hide leading zeros of energy counter and 1: show leading zeros of energy counter.

TABLE 8 : RS 485 Setup Codes

Buad Rate	Parity	Stop Bit	Parameter No
2400	NONE	1	0
2400	NONE	2	1
2400	EVEN	1	2
2400	ODD	1	3
4800	NONE	1	4
4800	NONE	2	5
4800	EVEN	1	6
4800	ODD	1	7
9600	NONE	1	8
9600	NONE	2	9
9600	EVEN	1	10

TABLE 8 : Continued

Baud Rate	Parity	Stop Bit	Parameter No
9600	ODD	1	11
19200	NONE	1	12
19200	NONE	2	13
19200	EVEN	1	14
19200	ODD	1	15
38400	NONE	1	16
38400	NONE	2	17
38400	EVEN	1	18
38400	ODD	1	19

7.4 User Assignable Modbus Registers

The Multifunction Meter contains the 14 user assignable registers in the address range of (31025) to (31051) (**See Table 9**).

Any of the parameter addresses (3X register addresses Table 4) accessible in the instrument can be mapped to these 14 user assignable registers.

Parameters (3X registers addresses) that resides in different locations may be accessed by the single request by re-mapping them to adjacent address in the user assignable registers area.

Table 9 : User Assignable 3X & 4X Data Registers

Address (3X)	Address (4X)	Assignable Register	Modbus Start Address (Hex)	
			High Byte	Low Byte
31025	41025	Assignable Register 1	04	00
31027	41027	Assignable Register 2	04	02
31029	41029	Assignable Register 3	04	04
31031	41031	Assignable Register 4	04	06
31033	41033	Assignable Register 5	04	08
31035	41035	Assignable Register 6	04	0A
31037	41037	Assignable Register 7	04	0C
31039	41039	Assignable Register 8	04	0E
31041	41041	Assignable Register 9	04	10
31043	41043	Assignable Register 10	04	12
31045	41045	Assignable Register 11	04	14
31047	41047	Assignable Register 12	04	16
31049	41049	Assignable Register 13	04	18
31051	41051	Assignable Register 14	04	1A

Table 10 : User Assignable mapping register (4X registers)

Address (4X)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
49501	Map Address for Assignable Register 1	25	1C
49502	Map Address for Assignable Register 2	25	1D
49503	Map Address for Assignable Register 3	25	1E
49504	Map Address for Assignable Register 4	25	1F
49505	Map Address for Assignable Register 5	25	20
49506	Map Address for Assignable Register 6	25	21
49507	Map Address for Assignable Register 7	25	22
49508	Map Address for Assignable Register 8	25	23
49509	Map Address for Assignable Register 9	25	24
49510	Map Address for Assignable Register 10	25	25
49511	Map Address for Assignable Register 11	25	26
49512	Map Address for Assignable Register 12	25	27
49513	Map Address for Assignable Register 13	25	28
49514	Map Address for Assignable Register 14	25	29

Example : Assigning parameter to user assignable registers
To access the voltage (3X address (30001) & Current (3X address (30007) through user assignable register assign these addresses to 4x register (Table 10) 251C (49501) & 251D (49502) Respectively.
Assigning Query:

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address Hi	25 (Hex)
Starting Address Lo	1C (Hex)
Number of Registers Hi	00 (Hex)*
Number of Registers Lo	02 (Hex)*
Byte Count	04 (Hex)

Data Register-1High Byte	00 (Hex)	Voltage (3X Address 30001)
Data Register-1 Low Byte	00 (Hex)	
Data Register-2 High Byte	00 (Hex)	Current (3X Address 30007)
Data Register-2 Low Byte	06 (Hex)	
CRC Low	D4 (Hex)	
CRC High	65 (Hex)	

* Note : Parameters should be assigned in Multiple of two i.e. 2,4,6,8.....14.

Response :

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	25 (Hex)
Start Address Low	1C (Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02 (Hex)
CRC Low	8B (Hex)
CRC High	C8 (Hex)

Reading parameter data through user assignable registers:
In assigning query voltage & Current parameters were assigned to 0000 & 0006 which will point to user assignable 3xregisters 0400 and 0402 (table9). So to read voltage and Current data reading query should be as below.

Query:

Device Address	01 (Hex)
Function Code	04 (Hex)
Start Address High	04 (Hex)
Start Address Low	00 (Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	04 (Hex)**
CRC Low	F0 (Hex)
CRC High	F9 (Hex)

Start address high : Most significant 8 bits of starting address of user assignable register.
Start address low :Least significant 8 bits of starting address of user assignable register.

Number of register Hi : Most significant 8 bits of number of registers requested.
Number of register Lo : Least significant 8 bits of number of registers requested.

****Note : Two consecutive 16 bit register represent one parameter.**
Since two parameters are requested four registers are required

Response : (Volt = 230 / Current = 5)

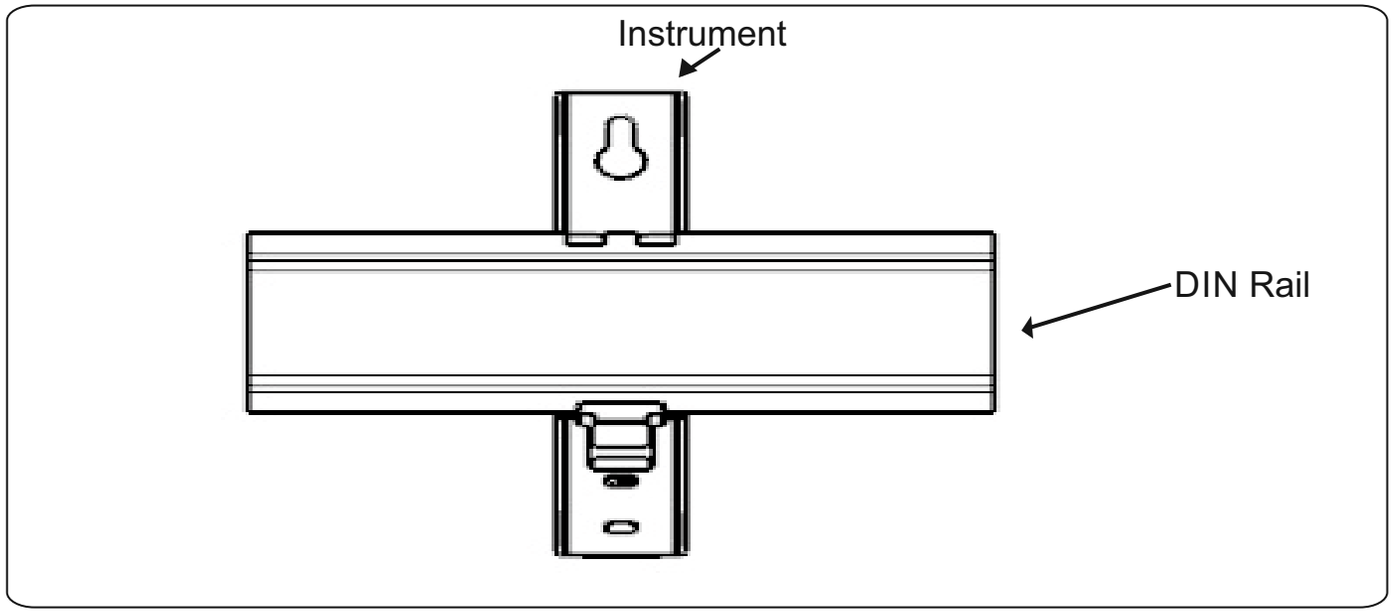
Device Address	01 (Hex)	
Function Code	04 (Hex)	
Byte count	08 (Hex)	
Data Register-1 High Byte	43 (Hex)	**Voltage Data**
Data Register-1 Low Byte	66 (Hex)	
Data Register-2 High Byte	00 (Hex)	
Data Register-2 Low Byte	00 (Hex)	
Data Register-3 High Byte	40 (Hex)	**Current Data**
Data Register-3 Low Byte	A0 (Hex)	
Data Register-4 High Byte	00 (Hex)	
Data Register-4 Low Byte	00 (Hex)	
CRC Low	73 (Hex)	
CRC High	CC(Hex)	

8. MBUS

For detailed information on the M-Bus communication Protocol, please refer to the M-Bus manual.

9. Installation

The Instrument should be mounted in a reasonably stable ambient temperature and where the operating temperature is within the range defined by the technical specification. Vibration should be kept to a minimum and the product should not be mounted where it will be subjected to excessive direct sunlight.



⚠ Caution

1. In the interest of safety and functionality this product must be installed by a qualified engineer, abiding by any local regulations.
2. Voltages dangerous to human life are present at some of the terminal connections of this unit. Ensure that all supplies are de-energised before attempting any connection or disconnection.
3. These products do not have internal fuses therefore external fuses must be used to ensure safety under fault conditions.
4. The installer is responsible for selecting appropriate supply side protection overcurrent device so, it is must to ensure that the maximum current rating and characteristics of that device.

⚠ Warning

1. Qualified personnel familiar with applicable codes and regulations must perform the installation.
2. Utilize insulated tools for device installation.
3. Install a fuse, thermal cut-off, or single-pole circuit breaker on the supply line, not on the neutral line.

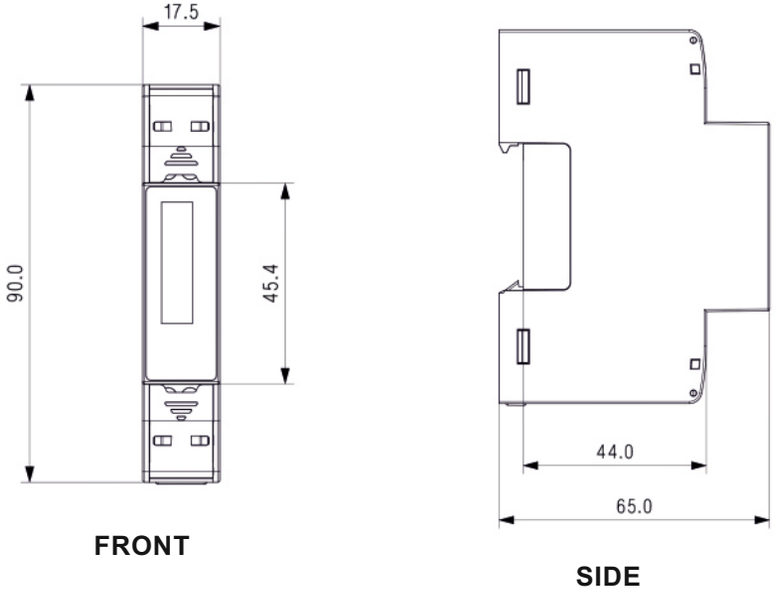
9.1 EMC Installation Requirements

This product has been designed to meet the certification of the EU directives when installed to a good code of practice for EMC in industrial environments, e.g.

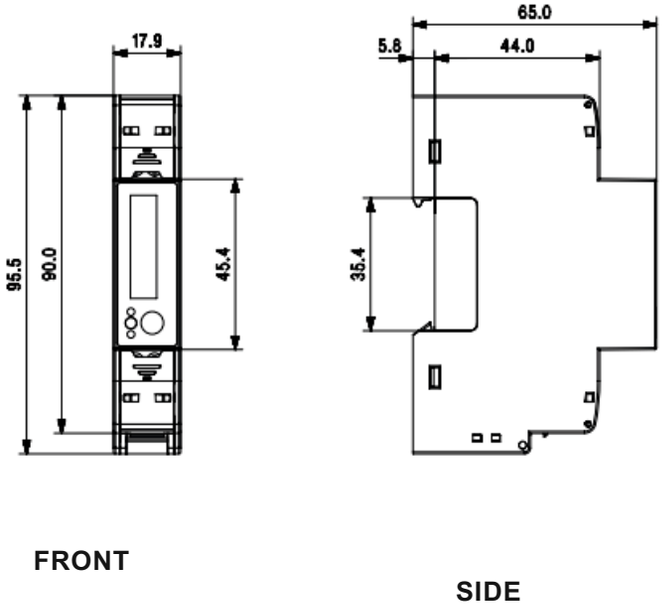
1. Screened output and low signal input leads or have provision for fitting RF suppression components,such as ferrite absorbers, line filters etc., in the event that RF fields cause problems.

Note : It is good practice to install sensitive electronic instruments that are performing critical functions, in EMC enclosures that protect against electrical interference which could cause a disturbance in function.
2. Avoid routing leads alongside cables and products that are, or could be, a source of interference.
3. To protect the product against permanent damage, surge transients must be limited to 2kV pk. It is good EMC practice to suppress differential surges to 2kV at the source. Theunit has been designed to automatically recover in the event of a high level of transients. In extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation.
4. ESD precautions must be taken at all times when handling this product.

9.2 Case Dimensions



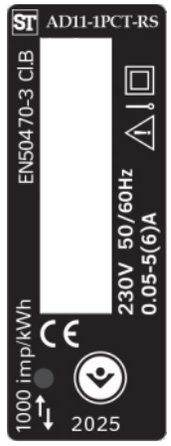
For AD11-1P45-x & AD11-1PCT-x Model

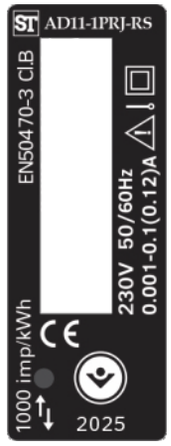


For AD11-1PRJ-x Model

9.3 Name Plate







9.4 Wiring

Input connections are made directly to screw-type terminals with indirect wire pressure. Numbering is clearly marked at the connector location. Choice of cable should meet local regulations.
Note : It is recommended to use **wire with** insulated pin type lug for **connection with meter.**
Wire: It is suggested to use wire with a temperature rating of at least 83 Deg. C
Guidelines:

1. To prevent the risk of electric shock, power supply to the equipment must be Kept OFF while doing the wiring Arrangement.
2. Wiring shall be done strictly according to the terminal layout. Confirm that all connections are correct.
3. Use lugged terminals.
4. To reduce electromagnetic interference use of wires with adequate ratings and twists of the same in equal size shall be made with shortest connections.
5. Layout of connecting cables shall be away from any internal EMI source.
6. Cable used for connection to power source, must have across section of 10 mm^2 These wires shall have current carrying capacity of 45A.
7. Copper cable should be used (Stranded or Single core cable).
8. Before attempting work on device, ensure absence of voltages using appropriate voltage detection device.

	ISO 7000-0434B(2004-01)	CAUTION
	ISO 7000-1641	Operating Instructions

For Direct Connected(AD11-1P45-x) Model :

Connections	Cable Size	Torque
L-In, L-Out, N	2.5-10 mm^2 use insulated pin types lugs	0.5-1.2 Nm
B, A, G, M+, M-, SO1+, SO1-, SO2+.	1 - 2.5 mm^2 use insulated pin types lugs	0.4 Nm

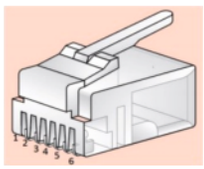
For CT Connected meters (AD11-1PCT-x) Model :

Connections	Cable Size (mm^2)	Torque Nm
L, N, I-In, I-out	1- 2.5 mm^2 use insulated pin types lugs	0.4 Nm
B, A, G, M+, M- SO1+, SO1-, SO2+, SO2-, TARIFF INPUTS.	1 - 2.5 mm^2 Stranded with pin types lugs.	0.4 Nm

For RJ-12 CT Meters (AD11-1PRJ-x) Model :

Connections	Cable Size (mm^2)	Torque (Nm)
L,N	1- 2.5 mm^2 use insulated pin types lugs	0.4 Nm
B, A, G / M+,M-,SO1+, SO1-, SO2+, SO2-, TARIFF INPUTS.	1 - 2.5 mm^2 Standard with pin types lugs.	0.4 Nm

For current use standard RJ12 connector



PIN NUMBER	1, 3, 5	2, 4, 6
CT SIDE	S1	S2

***Note:**
1. Pin number 1, 3, 5 are shorted.
2. Pin number 2, 4, 6 are shorted.

9.5 Auxiliary Supply

Meter is direct connected thus doesn't required external power source to operate. The power is derived from the signal source itself.

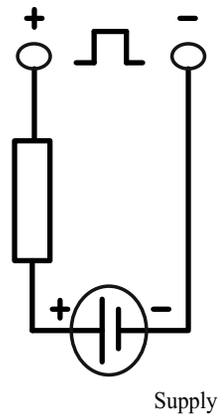
9.6 Fusing

It is recommended to choose fuse of a type and with breaking capacity appropriate to the supply and in accordance with local regulations.

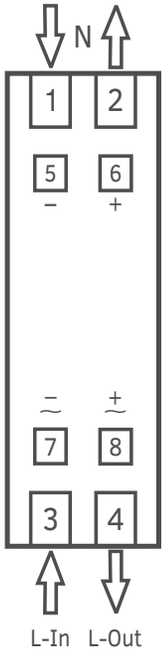
10. Connection Diagrams

Connection Terminals Detail:

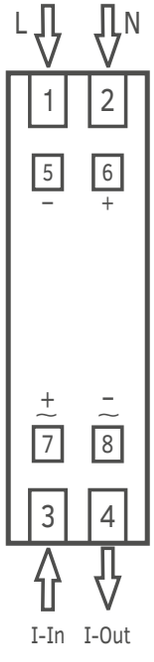
1 :Neutral In For AD11-1P45-x AND Line For AD11-1PCT-x & AD11-1PRJ-x
2 :Neutral out For AD11-1P45-x AND Neutral for AD11-1PCT-x & AD11-1PRJ-x
3 :Line In for AD11-1P45-x AND Current in for AD11-1PCT-x
4 :Line out for AD11-1P45-x AND Current out for AD11-1PCT-x
5,6 :Pulse Output Terminal
7,8 :Tariff input Terminal 7:~, 8:~ (in Tariff input Model)
:RS485 Terminal 7:B+, 8:A- (in Modbus Model)
:Mbus Terminal 7:M+, 8:M- (in MBUS Model)



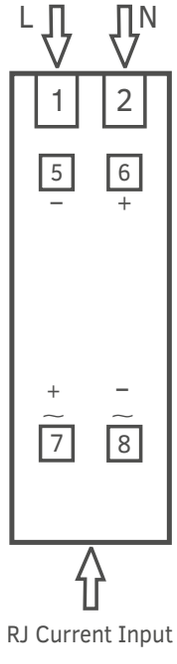
SO Connections



Connection Diagram
for ED-11XX-X model



Connection Diagram
for EC-11XX-X model



Connection Diagram
for ER-11XX-X model

11. Saftey Instructions :

Warning :



This indicates potential danger that can lead to death, serious injury, or significant material damage if not followed. Ignoring these instructions can cause death, serious injury, or major material damage.

Caution :



This indicates electric shock risk, which can also result in death, serious injury, or significant material damage.Risk of electric shock. Not taking precautions can result in death, serious injury, or major material damage.

Qualified Personnel:

- Only qualified individuals should install and operate this device.
- Qualified personnel are those with authorization and knowledge of labeling and grounding electrical equipment according to local safety regulations.

Intended Use:

- Use the device only as specified in the catalog and user manual.
- Use only with devices and components.

Proper Handling:

- Ensure proper transport, storage, installation, connection, operation, and maintenance for reliable operation.
- Be aware that parts of the meter may carry dangerous voltages during use.

Safety Precautions:

1. Use insulated tools suitable for the meter's voltages.
2. Do not connect the meter while the circuit is powered.
3. Install the meter in a dry environment within a suitable IP-rated enclosure.
4. Follow local installation codes and regulations.
5. Avoid installing in explosive areas or places with dust, mildew, or insects.
6. Use wires suitable for the meter's maximum current and ensure correct AC wire connections before powering the meter.
7. Do not touch the meter's connection clamps with bare hands or conductive materials to avoid electric shock.
8. Replace protection covers after installation.
9. Maintenance and repairs should only be performed by qualified personnel.
10. Do not break any seals on the meter as it may affect functionality, accuracy, and void the warranty.
11. Handle the meter carefully to avoid damaging internal components.
12. Ensure all clamps are properly tightened and wires fit securely to avoid bad contact and potential sparks.
13. If required clean the device with a microfiber cloth, keeping liquids away from the components.

12. Specification

Input :

Connections:	1 Phase 2 Wire
Nominal Voltage	230 VLN
Operating Voltage Range :	193 - 253 VLN
Power consumption in Voltage Circuit :	< 2 W (10 VA)
Power consumption in Current Circuit	< 1 VA
Nominal Frequency	50/60 Hz
Operating Frequency Range	45 to 66 Hz

Direct Current (AD11-1P45-x) Model :

Starting Current (Ist = 0.04*Itr)	20 mA
Minimum Current (Imin) (0.5*Itr)	250 mA
Transitional Current (Itr)	0.5 A
Nominal Current (I_n) (10*Itr)	5 A
Maximum Current (Imax) = (90*Itr)	45A
Operating Current Range	0.25-5(45) A
Short time Over-current	30*Imax for one half-cycle at 50 Hz

1A/5A(AD11-1PCT-x) Model :

Starting Current (Ist = 0.04*Itr)	2 mA for 1 A / 10 mA for 5 A
Minimum Current (Imin)(0.2*Itr)	10 mA for 1A / 50 mA for 5 A
Transitional Current (Itr)	50 mA for 1 A / 250 mA for 5 A
Nominal Current (I_n)(20*Itr)	1 A / 5 A
Maximum Current for 1A(Imax=120*Itr)	6 A
for 5A(Imax=24*Itr)	6 A
Operating Current Range	10 mA -1 A (1.2 A) / 50 mA - 5 A (6 A)
Short time Over-current	20*Imax for 0.5 seconds

RJ12(AD11-1PRJ-x) Model :

Starting Current (Ist = 0.04*Itr)	0.2 mA
Minimum Current (Imin) (0.2*Itr)	1 mA
Transitional Current (Itr)	5 mA
Nominal Current (I_n) (20*Itr)	100 mA
Maximum Current (Imax) = (24*Itr)	120 mA
Operating Current Range	1 mA - 100 mA(120 mA)
Short time Over-current	20*Imax for 0.5 seconds

Accuracy :

Active Energy (Import/Export)	Class B as per EN50470-3 : 2022 , Class 1 as per IEC 62053-21
Reactive Energy (Import/Export)	Class 2 as per IEC62053-23
Apparent Energy	± 1.0 %
Voltage	± 0.5% of of range max
Current	± 0.5% of Nominal value
Frequency	± 0.2% of Mid frequency
Active Power	± 1% of range max
Reactive Power	± 1% of range max
Apparent Power	± 1% of range max
Power Factor	±1%

Pulse Outputs :

SO1	Passive Opto-isolated
Contact Ranges	5 - 27V DC, 27 mA DC (max)
Pulse Duration	60 / 100 / 200 millisecond
Pulse Rate	1 / 10 / 100 / 1000 pulse per kWh
Impulse Rate	1000 pulse per kWh

Communication Interface :

MODBUS :

Protocol	RS485 MODBUS RTU
Baudrate	2.4 / 4.8 / 9.6 /19.2/38.4 kbps
Data Width	8
Parity	Stop Bits None -1 / None -2/ Even -1 / Odd -1
Device Address	1- 247
Response Time	250 millisecond at 9.6 Kbps Baudrate

MBUS :

Protocol	EN13757-3 MBUS
Baudrate	0.3/ 0.6/ 1.2/ 2.4/ 4.8/ 9.6 kbps
Data Width	8
Parity - Stop Bits	Even -1
Address	1....250

Display Ranges :

Active Energy	0.01-99999.99 kWh and Autoranging further
Reactive Energy	0.01-99999.99 kVARh
Apparent Energy	0.01-99999.99 kVAh

Active Power	0-99999 W
Reactive Power	0-99999 VAR
Apparent Power	0-99999 VA
Tariff Input:	
Low / High	0V / 230V
Installation :	Indoor
Enclosure	IP 51 (Front Side) and IP 20 (Terminals Side) (IEC 60529: 2001) (The device should only be mounted within an external enclosure, such as a meter or switch cabinet. This enclosure must offer a minimum of IP 51 protection and should be situated indoors. Only under these conditions protection against dust and water penetration assured in compliance with the IEC 62052-11.)
Housing	2 Module DIN 43880
Dimensions	17.5 mm X 90 mm X 65 mm (for AD11-1P45-x and AD11-1PCT-x models),
Weight	17.9 mm X 95.5 mm X 65 mm (for AD11-1PRJ-x models)
Mounting	150 gm
Safety :	35 mm DIN Rail
Safety Standard	
Installation Category	According to 62052-31:2015
Protective Class	III
High Voltage Test	II (EN 50470-3) / (IEC61010)
Impulse Voltage Withstand	4 kV AC, 50Hz for 1 minute between all electrical circuits
Pollution Degree	6.0 kV (1.2 microsecond waveform)
Housing Flame Resistance	2
Environmental Conditions :	Flammability Class V-0 acc. to UL 94, Self Extinguishing, Non Dripping, free of Halogen
Mechanical Environment	
Electromagnetic Environment	
Operating Temperature	M1
Storage/Transport Temperature	E2
Relative Humidity	-25°C to +55°C
Shock	-40°C to +70°C
	0... 95% (Non Condensing)
Vibration	Half sine wave, peak acceleration $30g_n$ (300 m/s^2), pulse duration 18msec
Altitude	10...150Hz, f<60 Hz 0.075mm constant amplitude, f>60Hz $1g_n$ constant acceleration, 10 sweep cycles per axis

NOTE

Sifam tinsley
PRECISION INSTRUMENTATION

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